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A New Lizard of the Genus *Cnemidophorus* from Arizona

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This study was begun independently by both authors in 1950, during which year both engaged in field work in southern Arizona and collected specimens of the new form described herein. The present collaboration represents a joining of efforts which independently reached the manuscript stage similarly describing the new form as a race of *Cnemidophorus sacki*.

As presently understood, the Baboquivari Mountains (elev. to 7864 ft.) in southern Pima County, Arizona, form the westernmost limit of the range of *Cnemidophorus sacki* at the approximate latitude of the United States-Mexico international boundary. Recently, however, this species has been taken approximately 75 miles west of the Baboquivari Mountains in the Ajo Mountains (elev. to 5000 ft.) of extreme western Pima County. The Ajo Mountains are similar to the Baboquivari Mountains in breaking a generally low desert relief, which becomes progressively lower in elevation west of Tucson (elev. 2400 ft.) to sea level at the mouth of the Colorado River. The Ajo Mountains provide certain relictual environments supporting westernmost ecologically and geographically isolated populations of plants and animals, which have their remaining and more uniform distributions disjunctive to the east and south, that is, in the direction of generally more favorable environments. The isolated population of *Cnemidophorus sacki* in the Ajo area is more than usually distinctive and is described herein as a new subspecies.

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Cnemidophorus sacki xanthonotus subsp. nov.³

Holotype. University of Michigan Museum of Zoology, No. **105426**, an adult male collected in the north fork of Alamo Canyon, Ajo Mountains, approximately **19** miles north of the international boundry in Organ Pipe Cactus National Monument, Pima County, Arizona; by Charles H. Lowe, Jr.; June **15, 1951**. Figures 1 and 2.

Paratypes. University of Michigan Museum of Zoology **104330-1**; University of Arizona Department of Zoology **5111-4**; University of California Museum of Vertebrate Zoology 57047-8; and organ Pipe National Monument **149**; all from the north fork of Alamo Canyon.

Diagnosis. *C. sacki xanthonotus* is a large form characterized (in life, and well in alcohol preservation) by: (1) a striking reddish-brown to reddish-orange suffusion of color on the dorsal body surface sharply delimited at the dorso-lateral contours; (2) ground color of lateral surfaces of body and upper surfaces of neck, legs, and feet a sharply contrasting dark grayish-green; (3) from 0 to **6** (usually less than 4) variably well defined longitudinal light body stripes; (4) no vertebral (middorsal) stripe; (5) numerous small, well defined, light colored spots evenly distributed on the body and neck, present on the upper surfaces of the base of the tail roughly in two longitudinal rows in the dark fields between the narrow light stripes, occasionally in the dark middorsal field between the paravertebral light stripes, and sometimes directly on the light body stripes; (6) spots on the dorsal surface of the body light orange-red in color; (7) scales of the circumorbital semicircle series extending antieriad to be nearly or actually in contact with the frontal-frontoparietal suture; (8) **4-6** scales between the paravertebral light stripes; (9) femoral pores **18.1 +/- .29**.

Description of Holotype. This is an adult male with a snout-vent length **89** mm.; tail (perfect) length **219** mm.; right hind limb to base of fourth claw **67.2** mm.

The scalation is typical of that of the *sacki* group: two parietals, one interparietal, four supraoculars; mesoptychials and postantibrachials markedly enlarged; three suboculars; preocular on each side long and in broad contact with the fourth supralabial; circumorbital semicircles extended antieriad to near contact with the frontal-frontoparietal suture. Three preanals with a slightly enlarged scale in the apex (anterior to the first preanal), which is not considered here in the preanal series. The femoral pores number 16/17.

The following color description is of the live specimen. All color determinations refer to Maerz and Paul (1930). The dorsal coloration of the

xanthos—Gr. **orange or yellow**; *notos*—Gr. **back**.

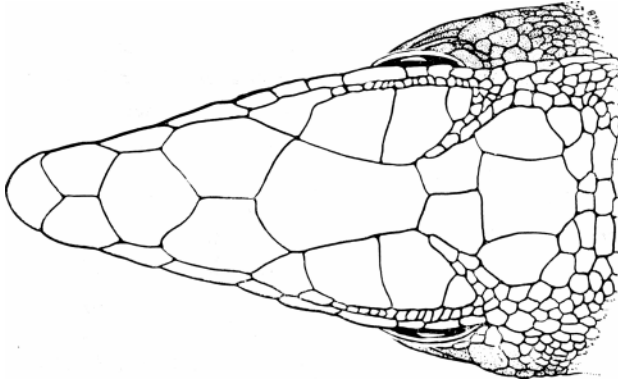


Figure 1. Dorsal *view* of the head of the type specimen, UMMZ 105426, showing the anterior extension of the circumorbital semicircle series.

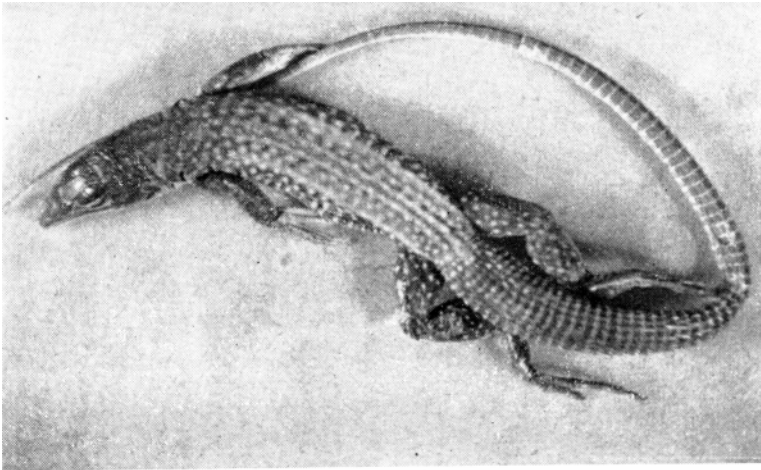


Figure 2. Dorsal view of the type specimen, UMMZ 105426, showing characteristic color pattern.

body is a striking suffusion of reddish-brown, nearly obscuring the underlying stripes and spots which are typical of *sacki*. This conspicuous color is sharply delimited along the dorsolateral contours where it meets the equally striking grayish-green of the sides. The dorsal reddish color extends posteriorly from the shoulder area to the base of the tail, where it superficially covers the longitudinal stripes and attendant spots. This color is near Pl. 5, H 12. In the darker fields the reddish-brown is Pl. 6, J 12. The dark grayish-green lateral coloration is near Pl. 23, A 5. This color extends onto the legs and feet which are slightly darker than the lateral body surfaces. The hind limbs are flecked and spotted with pale yellow (Pl. 18, D 1) on the proximal segment and with dull gray distally. Small gray spots are also present on the hind feet. The anterior limbs are unspotted.

The sides are marked with light gray vertical bars (Pl. 20, A 1) which may be somewhat broken into small spots. The spots in the dorsal paravertebral fields are light orange-red and are arranged in two rows in each field. The dorsolateral spots are similarly arranged in longitudinal rows.

The head and neck are dark olive brown above, the head near Pl. 16, A 11, and the neck Pl. 16, C 11. The reddish-brown of the dorsum gradually merges with the darker brown of the neck just posterior to the insertions of the forelimbs. The lateral coloration of the head tends toward olive. The lower labials are faint bluish-green; the upper labials and side of snout are light brown. The dorsal half of the tail is olive green. The posterior tips of the scales of the dorsal surface of the tail are marked with a light yellow, and the small spots at the base of the tail are tinged with yellow.

The ventral surfaces of the body and head are cream color suffused with bluish-green. The ventral surface of the tail is cream with particularly noticeable gray marks along the whorl margins. The ventral surfaces of the limbs are immaculate cream color.

Variation and ontogenetic change. The characteristics of the adults are initially present in the hatchlings and remain present throughout life. Hence, unlike conditions with other forms there is no problem in immediately assigning 100 per cent of the individuals.

This is a large race. The largest specimen available (Organ Pipe Mon. 149) measures 99 mm. snout-vent; tail (perfect) 257 mm.

While the coloration given for the type specimen serves well for most individuals, noticeable variation occurs in the degree of intensity of the coloring of the dorsal surface of the body. In life this varies from reddish-orange to reddish-brown and is fairly well retained in alcohol preservation. All ages exhibit this characteristic to some extent, and in some it is so intense that the underlying pattern of light spots and stripes is almost completely obscured.

In the majority, however, the underlying pattern is more or less discernable (more so in younger specimens). Accordingly, the stripes and spots of the dorsal surface of the body are more or less red in color, varying in intensity among individuals. Longitudinal light colored body stripes may be present or absent irrespective of the intensity of the red dorsal coloring. The maximum number of stripes is six, and the usual number is less than four, with the lateral pair most regularly missing. A vertebral stripe is never present, and the paravertebral stripes are accordingly close together, separated by four to six scale rows. The striped pattern is retained, and the light spots are always present with no exceptionally marked variation from the distribution given for the type.

The scales of the circumorbital semicircle series vary in the extreme to which they are extended anteriorly. All are carried forward to approximately the midpoint of the lateral border of the frontoparietal scale and may extend as far forward as the suture between the frontal and the frontoparietal. The single preocular is highly variable and may or may not be elongated so as to make broad contact with the fourth supralabial. Occasionally, a suture divides the otherwise elongated preocular into two scales; the smaller (frenocular) is bordered anteriorly by the loreal, below by the fourth supralabial, and posteriorly by the first subocular.

The preanal scales usually number three. The relatively large anterior preanal is rarely split, giving a total of four preanal scales. An additional slightly enlarged scale in the apex, anterior to the first preanal, is not considered to be a part of the preanal series. The femoral pores number $18.1 \pm .29$ (16-21).

Distribution and locality records. A total of thirteen specimens has been available for this study. Aside from the type material, there is one specimen in the collection of the University of Arizona (5115) from the Puerto Blanco Mountains, 4 miles northwest of the monument headquarters in Organ Pipe National Monument, and two specimens from the mouth of Alamo Canyon in the private collection of Allan R. Phillips of Tucson, Arizona. The junior author has observed the lizard in the south fork of Alamo Canyon, Ajo Mountains, and William R. Supernauth of Organ Pipe National Monument has observed it in Bull Pastures, Ajo Mountains. As presently known, *C. sacki xanthonotus* is known only from the Ajo and Puerto Blanco Mountains, Organ Pipe National Monument, Pima County, Arizona. It possibly occurs more widely in the cool and mesic higher elevations of the Ajo and surrounding mountains.

Comparisons. *Cnemidophorus sacki xanthonotus* has clearly been derived by differentiation in isolation from a population of what is now a widespread form to the east, *C. sacki stictogrammus*. The latter occurs geographically closest to *xanthonotus* in the Baboquivari Mountains of Pima County, Arizona, from which comparative material was collected for this study. *C. s. xanthonotus* is clearly undergoing genetic divergence from the characteristics of a *stictogrammus* type. At the present time it is a highly distinctive yet quite variable form. The general trend involves, among other things, the loss of the definitive longitudinal light body stripes of the *sexlineatus* group. Nevertheless, it is to be emphasized that the allopatric *xanthonotus* today still retains the basic *sacki* characteristic of longitudinal body stripes. In individuals with stripes unobscured, they are seen to follow the stripe pattern placement of *stictogrammus*, which is 2 paravertebral, 2 dorsolateral, and 2 lateral stripes, totalling six, with no vertebral stripe. The spotting is also similar to that in many populations of *stictogrammus*.

The circumorbital semicircle series alone serves well to differentiate *xanthonotus* from other forms. The unusual elongation of the preocular is again distinctive although not invariable.

The ground colors of reddish and greenish hues in combination give such a striking appearance to *xanthonotus* that at first glance it gives the appearance of a distinct species. However, it is clearly a vicarious differentiate of *C. sacki* apparently recently isolated in the Ajo area as indicated by its tolerance of desert edge habitats. This hypothesis is supported by recent paleobotanical evidence and inferences pertaining to the evolution of the deserts (Axelrod, 1950).

Ecology. The desert habitats in the general area of the Ajo Mountains are quite varied. The Lower Colorado Valley microphyllous desert (*Larrea-Franseria*) distinguished by its simplicity of composition on predominantly sandy plains and by such characteristic reptiles as *Crotalus cerastes* and *Dipsosaurus dorsalis*, reaches its easternmost limits in this region. Here it merges with the more complex Arizona Upland crassicaulescent desert (*Cercidium-Opuntia*). In the latter there is a marked increase in structure, density, and number of species (Shreve, 1951). From west to east across these areas there is a gradual increase in annual rainfall from 5 to 10 inches. Thus, the Ajo Mountains have a very rich desert fauna and flora, while at the same time affording sufficient moisture in canyon bottoms, on north-facing slopes, and at higher elevations to support more mesic relict communities. Here are the westernmost and relict populations of an oak (*Quercus turbinella*) and a juniper (*Juniperus monosperma*), both of which have wide ranges to the east. Several

expected reptiles, that also have wide ranges to the east, are present in the juniper-oak-desert edge ecotone of the various branches of Alamo Canyon on the west slope of the mountains. Included in these is *Cnemidophorus sacki xanthonotus*, along with *Sceloporus clarki*, *Masticophis bilineatus*, *Crotalus molossus*, and *Thamnophis cyrtopsis*. All of these forms occur here, abutting on the edge of the Lower Colorado Valley microphyllous section of the Sonoran Desert, as westernmost isolated populations at this latitude. All have wider ranges to the east and south.

In the lower canyons on the west slope of the Ajo Mountains, such as Alamo Canyon, opportunity is afforded for the usual sympatric contacts of several reptilian species pairs. Thus, the contact of *Cnemidophorus tigris* from below with *C. sacki* from above is paralleled by sympatry of *Sceloporus magister* and *S. clarki*, *Crotaphytus wislizeni* and *C. collaris*, and *Uta stansburiana* and *Urosaurus ornatus*.

The three forks of Alamo Canyon are narrow and rocky and well covered by highly varied vegetation. The canyon bottoms have intermittent surface water retained in protected pools at several levels of the canyon for various periods of time during several months of the year. Above 3000 feet in the north fork of Alamo Canyon there are distinctive vegetational differences on the canyon slopes. There is an interdigitation of the vegetational types at the same elevation at the upper edge of the desert. For example, at the type locality at 3400 feet, sahuaro, organ pipe, chollas, ocotillo, mesquite, creosote-bush, and brittle-bush are conspicuous on the south facing slopes. On opposite north facing slopes these are all absent or virtually absent, these protected slopes being densely covered by a type of vegetation characterized by *Juniperus*, *Simmondsia*, *Vaquerlinia*, *Berberis*, *Ephedra*, *Agave*, and fairly abundant grass. In this abrupt ecotonal habitat the conspicuous lizard associates of *Cnemidophorus sacki xanthonotus* are *Crotaphytus collaris baileyi*, *Sceloporus c. clarki*, and *Urosaurus ornatus*, all of which are typical of higher vegetation zones.

Remarks. The higher elevations of the Ajo Mountains have not yet been adequately explored herpetologically. It appears that *Cnemidophorus sacki xanthonotus* will be found commonly in the still more mesic, higher environments, and but marginal in existence where it occurs in less abundant numbers at the type locality and down to an elevation of 2400 ft. in the mouth of Alamo Canyon.

William R. Supernauth, superintendant of Organ Pipe National Monument, has been very helpful throughout the course of this work. It was he who first informed the senior author of the presence of these lizards in Alamo

Canyon. The authors are in debt to William Brudon of the University of Michigan for the drawing of the head of the type specimen. The photograph of the type was taken by the senior author.

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